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## IX. *Extract of a Letter from Dr.* Brook Taylor, F. R. S. *to Sir* Hans Sloan, *dated* 25. June, 1714. *Giving an Account of ſome Experiments relating to Magnetiſm.*

AFter having given an Account of an Experiment made with the large Magnet in the Repoſitory of the *Royal Society*, (which Experiment is deſcribed in *Philoſoph. Tranſact.* No. 344. Article 4.) The Letter goes on with the ſame Subject as follows. -- If it were known what point within the Stone, and what point in the Needle are the Centers of the Magnetical power, it would be eaſy to find the true powers of the Magnet at all the diſtances obſerved. For want of that Knowledge, I have computed the Forces from the Center of the Needle, and the Extremity of the Loadſtone, and find, that at the diſtance of nine Feet, the Power alters faſter, than as the Cubes of the diſtances, whereas at the diſtances of one and two Feet, the Power alters nearly as their Squares. To try whether the Law, by which the Magnetiſm alters, could be reduced at all diſtances to any one certain power of thoſe diſtances, I ſought thoſe points in the Needle and Stone, which being uſed as the Centers of the power, might have that property. But in that caſe, I found the Center of the Stone muſt be carried quite out of its Figure, to make the diſtances large enough for this purpoſe. From whence it ſeems to appear, that the power of

Magnetiſm

Magnetiſm does not alter according to any particular power of the diſtances, but decreaſes much faſter in the greater diſtances, than it does in the near ones.

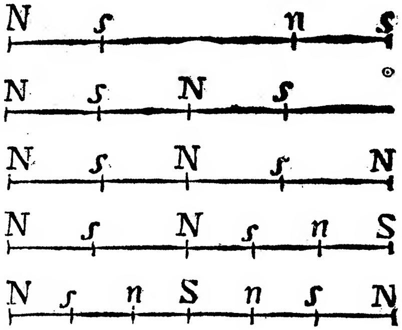
This ſeems to be confirmed by other Experiments I made. The firſt Experiment was thus; I made a Needle $\frac{1}{4}$ of an Inch long, of very fine Steel-wire (a Foot length of which weigh'd but a Grain) which I lengthen'd by ſticking a light piece of Ruſh to it, ſo that I could obſerve the Direction of the Needle in all the trials with a *Radius* of two Inches. Inſtead of a Magnet I uſed a touch'd Needle of Steel-wire, which I ſet on a perpendicular to the Horizontal Plane I made the Obſervations on, by means of a Frame I made to tranſport it from one place to another; the North end of the Needle being placed downwards, and made a little ſharp, that it might mark the Paper it was ſet upon in every poſition, by preſſing the top of the Needle gently with the Finger. The Obſervations were made in this manner; after having taken notice of the natural direction of the ſmall Compaſs Needle, I brought the perpendicular Needle as near to it as I conveniently could, ſetting it in ſuch a manner, that a Line from the upright Needle to the Center of the Compaſs might be perpendicular to the Compaſs Needle. Then obſerving the ſame caution (which was convenient to make the Center of the Compaſs ſerve ſufficiently well to be eſteem'd its Center of Power) I placed the upright Needle at ſeveral greater diſtances, every time marking the place in the manner already deſcribed, and obſerving the Variation of the Compaſs. By this means I got a Curve pretty regularly and fairly drawn by points on the paper. And by examining this

Curve, compared with the Variations of the Compaſs correſponding to its reſpective points, I found that the Magnetical power decreaſed faſter at the greater diſtances than at the nearer. It is of little uſe to be very particular in the account of the ſeveral Obſervations. I ſhall only take notice, that at about two Inches and a quarter diſtance, the Force did not alter ſo faſt as the Squares, and at ten Inches diſtance (where the Variation was one degree only) it alter'd faſter than the Cubes, the Index of the Power being about $3\frac{1}{4}$. The Needle of the Compaſs was ſo ſhort, that to ſuppoſe its Center of Force to be either in the middle or at the extremity of it, would not alter the Index of the Powers of the diſtances $\frac{1}{20}$ of an Unite.

I made another Experiment to the ſame purpoſe, with a Compaſs Needle made of a ſlight piece of Straw, with a ſmall piece of Steel-wire faſten'd to one end of it, which was always kept in the ſame poſition, being balanced between two perpendicular Needles, one of which was moveable, and the other fix'd. The Event was much the ſame as in the former Experiment.

Endeavouring to find the true Poles, or Centers of the magnetical Power in touch'd Needles, I made a Needle of two Inches long, of the fine Steel-wire, which I touch'd with the South point of a ſmall capt Loadſtone, applying the point of the Cap only to the Extremity of the Needle, without drawing it along. The Needle ſo touch'd, being laid gently on the Surface of a ſtagnant Water, floated. I then applied to it ſucceſſively the two ends of a touch'd Needle,

Needle, as near as I could, without letting the Needles touch. The reſult was, that the floating Needle reſted under the reſpective Poles of the other Needle mark'd with the ſmall Letters *s*, *n*, *s*. So that by one Touch with the Loadſtone, which gave the Needle a North-pole at *N*, where it was touch'd, it acquir'd three other Poles, *s*, *n*, *s*, which we may not therefore improperly call its conſequential Poles. Having diſcover'd theſe conſequential Poles, I made ſome other Experiments to diſcover more of the Nature of them, as they are deſcrib'd in the Scheme annexed. The Needles were all of them two Inches long, made of the ſame fine Steel-wire, and the Letters *N*, or *n*, and *S*, or *s*, denote the Character of North or South belonging to the points mark'd; the great Letters ſignifying the points the Loadſtone was applied to, and the ſmall Letters ſhewing the conſequential Poles.



There are two other Experiments deſcribed in the ſame Letter, relating to the Attraction of Fluids, one of which (*viz.* that of the *Hyperbola*, made by the Surface of the Water between two Glaſs-planes) being already deſcribed in theſe *Tranſactions* (No. 336.) we ſhall only tranſcribe the Account given of the other.

I took ſeveral very thin pieces of Fir-board, and having hung them ſucceſſively in a convenient manner to a nice pair of Scales, I tried what Weight was neceſſary, (over and above their own, after they had been well ſoak'd in Water) to ſeparate them at once from the Surface of ſtagnating Water. I found 50 Grains to ſeparate a Surface of one Inch ſquare; and the Weight in every trial being exactly proportional to the Surface, I was encourag'd to think the Experiment well made. The diſtance of the under Surface of the Board from the Surface of the ſtagnating Water, at the time they ſeparated, I found to be $\frac{16}{100}$ of an Inch; though I believe it would be found greater, if it could be meaſured at a greater diſtance from the Edge of the Board, than I could do it, the Water riſing a little before it came quite under the Edge of the Board.

*FINIS.*

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